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ABSTRACT

This document investigates whether medical education should be subsidized by federal funds. The first chapter discusses the growing debate over medical school financing. Chapter two reviews subsidies, equity, and social welfare. Chapter three gives four rationales for public subsidies, including market structure, slipovers, inappropriate prices, and risk and imperfect information. Chapter four discusses medical education and competition. Conclusions indicate that the present level of public support for medical education is excessive. Federal subsidies should be reduced while medical students should be expected to pay a much larger proportion of their educational costs. (MJM)

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WHY SHOULD WE SUBSIDIZE MEDICAL EDUCATION?

by George E. Wright, Jr.

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I. THE GROWING DEBATE OVER MEDICAL SCHOOL FINANCING

In 1973, we completed the first decade of federal programs funded specifically to aid education in health professions schools. Between FY 1965, when the Health Professions Educational Assistance programs began to receive significant funding, and FY 1973, the H.P.E.A. and related programs administered by the Health Resources Administration poured a total of over $2.8 billion into the training of health manpower.[1] The H.R.A. programs, however, are only the most visible portion of a flood of federal dollars appropriated specifically for health manpower training. These total funds have risen spectacularly from an annual rate of $564 million in FY 1967 to $1.4 billion in FY 1973, and the biggest single beneficiary of this increase has been the U.S. medical school.[2] Indeed, if one combines their receipts for research as well as instruction from all federal, state, and local governments, public funding of medical schools has increased from an annual rate of $320 million to over $1.2 billion in the decade since 1962.[3] Over the same period--if we exclude government-sponsored research which currently runs over $600 million a year and concentrate on public subsidies for education--annual medical school receipts have jumped from $2,730 per enrolled medical student to almost $11,300 per student.[4] This prodigious increase is made all the more remarkable by the fact that these figures do not include the massive public support for medical school construction. Truly, few institutions in this country have enjoyed such generous support.

These large subsidy programs raise an obvious question: Why has so much public support been provided to medical schools? The primary justification

given in the Congressional hearings for the original 1963 Health Professions Educational Assistance Act and in all of its subsequent extensions and elaborations is that the country faces a doctor shortage. Medical education has been felt to be so expensive that left unsupported, medical schools could not maintain the current output of high quality physicians let alone significantly increase their enrollments to meet unfilled needs and future demands. Certainly, high quality and innovative curriculum could not be provided without external support.

This line of argument is now under attack from sources within and without the Federal Government.[5] First, it is believed that the subsidy programs have been so successful that present medical school enrollments, rather than perpetuating a doctor shortage are now threatening a doctor surplus. Moreover, critics see the rationale for subsidy to be all the more dubious in light of its substantial inequities. Is it right to pour so many public resources into the education of entrants into the highest paid profession in the United States, and indeed the world? These are important objections to the whole notion of public and particularly federal subsidies to medical education. Since the entire package of federal health manpower legislation is now up for renewal before Congress, it is particularly urgent that those who support present government programs come to terms with the criticism. The purpose of this paper is therefore to lay out in systematic form the various arguments for and against subsidies and the conclusions which can be drawn from them.

As outlined above, the objections to the present subsidies implicitly recognize two major criteria by which one can evaluate any public subsidy program:

1. The equity or fairness by which funds are transferred from taxpayers to beneficiaries.

2. The changes in social welfare created by reallocating resources from one use to another.

II. SUBSIDIES, EQUITY AND SOCIAL WELFARE

Although public support of medical education may accomplish many laudable objectives, the equity of the system leaves something to be desired. We have here a clear case of the poor and middle class subsidizing the rich. Two recent studies of the costs of medical education estimate that a year of medical instruction costs on the average between $12,650 and $20,370. Average annual tuition and fees currently runs about $1,200. This adds up to a minimum of $45,000 to subsidize the education of the average medical school graduate, from government and non-government sources.[6] Who benefits from this substantial largess? The parental income of medical students runs almost double the national average. In 1967-68, 41% of the parents of students made over $15,000; 20% earned over $25,000. The comparative figures for all U.S. families was 12% and 2%. Whereas overall only 12% of male heads of family have a college education, 51% of medical student fathers have a college degree or better.[7] Meanwhile, the average family income of physicians, more than triple the national average, is growing twice as fast as the average for everyone else.[8] Clearly, we are using taxes paid mostly by a population of moderate income and education to provide huge subsidies to the children of the most wealthy and educated strata of our society, who will then be able to earn incomes double that of even their parents. It is small wonder that Administration spokesmen have begun to ask "if it is appropriate for the Federal Government to bear so substantial a share of the cost of preparing individuals for careers that offer about the highest earning power of our society."[9]

The inequities of public subsidies to education are, of course, not

confined to medical schools. It is a consistent feature of all higher education.[10] Society may, however, tolerate inequities if the lack of a subsidy would cause such a substantial underproduction of high-level manpower that the economy could neither grow, maintain its current output, nor meet agreed-upon social goals. In the case of doctors, the available evidence does not indicate any strong role that physicians play in economic growth. Certainly good health influences our productivity, but overall health and mortality appear to be primarily due to sanitation, nutrition, vaccines, education, and the like; studies have yet to find any correlation between the number of doctors and the level of health.[11] For example, most European nations, with better health and mortality statistics than the United States, provide health care with fewer doctors per person than we do.

The basic rationale for subsidizing medical education must therefore lie in meeting social goals which are not necessarily directly related to increasing the productivity of the economy. In terms of social welfare the primary demand is not for physicians per se; the basic demand is for the health care they produce. It follows that ideally we should keep increasing the number of doctors until additional M.D.s do not produce enough socially valuable care to warrant any further investment in their education.* This is indeed a key

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*The term "socially valuable" is extremely difficult to evaluate in the provision of health services. There is, unfortunately, a strong tendency to use a priori notions in establishing how much care people "need" and the "proper" role of physicians in delivering it. The real criterion, however, should be: given the cost of training M.D.s, how much of their services does society demand. Ideally, this demand should not be reinterpreted in terms of expert and often elitist views on how much of it is "excessive," "wasteful," or "inefficient." Yet the real possibility that demand is not independent but is heavily influenced by physicians who can literally create their own demand means we cannot always avoid the use of external standards. See footnote 12 for sources.

point in any analysis of public subsidies. The issue is not what physicians as a group add or do not add to the economy or social welfare; the issue is the value of what additional doctors will provide and what additional public subsidies are required to educate them. Education is a process by which new doctors are added to an existing supply. (At low school enrollments it replaces retiring physicians.) Subsidies to education must therefore be justified in terms of the extra services the new graduates will provide.

The prime justification for the public subsidy of any good or service is the argument that if matters were left to the open operations of supply and demand, left to the whims of a laissez faire market mechanism, we would be saddled with underproduction. There is justification for public intervention if we are certain that the market mechanism will fail; that is, fail to regulate production so that the social value produced by additional physicians matches the cost of training them. The possible causes of market failure thus become the primary rationales for public subsidies, and it is to an analysis of these causes that we now turn.

III. FOUR RATIONALES FOR PUBLIC SUBSIDIES

In the case of medical schools, there are four major potential reasons why unsubsidized education, with the student paying full costs, might lead to an underproduction of physicians: market structure, spillovers, artificial prices, and risk and imperfect information.

A. Market Structure

The most common sense reason for subsidizing medical education is the simple observation that few families can possibly afford to finance its full cost. As it is, medical school is an enormously expensive proposition, and

financial aid does not meet the demand. In 1967, four years of medical school cost the average student $17,576. To finance this over 50% of seniors graduated in debt, but only the very wealthy had the equity to borrow substantial amounts.[13] Since most schools strongly discourage any outside jobs and do not offer the teaching and research fellowships open to other graduate students, the expenses must be met mostly by spouse or family. The costs to the student of four years of medical school now run almost $27,000.[14] If, in addition, government subsidies were halted and the student had to pay the full cost of instruction, expenses could easily triple.[15] How many families could finance an education beyond college costing $70,000 or more? Surely physicians would be confined to a narrow, wealthy elite.

This is a powerful argument, but by itself it implies no absolute need for subsidies. Families of even moderate means do take out loans for $25,000 or more in the form of a home mortgage. It is therefore possible to borrow the cost of education. The problem, of course, is that a student cannot offer his future status and income as collateral to a bank, and thus families must guarantee the loan. This limits access to funds to only the wealthiest of families and requires a massive parental commitment to an adult offspring, an assumption that fits fewer and fewer families.

Here is a clear role for public intervention. An expansion of the present system of direct federal and guaranteed loans which does make it possible for the individual medical student to offer his future income as collateral could become the means of financing education without subsidies from middle class taxpayers to the wealthy. A host of difficulties lie in designing such a program if numerous side effects are to be avoided. At the minimum, loan repayment must be tied to income so that new M.D.s are not forced

into solely high-paying practices. In addition, students from low-income families may simply be unwilling to take on substantial indebtedness regardless of future income and may require additional grants.* We should note carefully, however, that under no circumstances is the desire to aid lower-income groups ever a justification for blanket subsidies made directly to medical schools or all medical students.

This analysis of the role of public intervention also applies to financing the construction and expansion of medical schools. Here again, the structure of financial markets often makes it impossible for schools to borrow the necessary capital. This does not automatically imply, however, that we should offer large construction grants. Much of the problem can be met by expanding present interest subsidy plans and establishing mechanisms for public provision and guarantee of medical school mortgages.

B. Spillovers

There are, however, more sophisticated arguments for public subsidies, which attempt to demonstrate that even if difficulties such as access to loan funds are corrected, the market mechanism will still fail and we will educate too few doctors. "Spillovers" are the classic cause for failure in any market. If an individual purchases a good or service for his own use and enjoyment, yet his purchase affects others, then the stage is set for market failure. If the benefits of consumption spill over from the individual who made the purchase to others who have paid nothing, those private costs and benefits are different from social costs and benefits to

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*There are many other difficulties with the actual design of a program to enable students to borrow the costs of education, and an extensive literature is developing centered around the concepts of an Education Opportunity Bank and tuition deferment plans. See footnote 16 for basic sources.

the community as a whole. In such cases, the producer of the desired good or service does not collect from all who benefit, and since his income is understated he does not produce enough to meet full social demand. For example, if polio vaccine had not been discovered, projections show that instead of the thousand cases experienced in 1961, we would have suffered through almost 30 thousand cases of polio.[17] Yet if the effect of the vaccine had been limited to only those who were actually injected, the expected number of cases would have been 8,470. The difference of almost 7,500 is primarily due to the effect of immunization on limiting the spread of polio virus. Clearly, if parents pay to have their child vaccinated, unvaccinated children also benefit through reduced risk of infection. There is a spillover of the benefits from those who have paid for the vaccine to those who have not. If immunization were left completely free of public programs for subsidy, distribution, and information, we would expect an underutilization of the vaccine, since the protection afforded unvaccinated children by the immunization of others would reduce the incentive for all parents to pay for the vaccine. The result would be too high an incidence of polio, for which all of society would bear the cost.

Spillover benefits have been traditionally advanced as justification for the huge subsidies to all post-secondary education. Yet, as one reviewer concluded, specifics supporting this assertion have been "woefully weak. . . . There is virtually no firm evidence on whether or not these benefits exist. And if they do exist, how valuable are they and to whom are they valuable?"[18] In the case of medical education, can we pinpoint benefits which accrue to society as a whole beyond those directly enjoyed by the purchasers of M.D. services? Can we find evidence that society as a whole would be willing to

subsidize physician income above the present fees collected directly from patients? If so, we have reason to publicly fund medical education, which, after all, is a form of subsidizing life-time physician income. We may be assured that if doctors were required to pay the full cost of their education, the number of high-quality students applying to medical school would be increasingly sensitive to changes in future income. If, as in the case of vaccine, those who did not directly use a physician's services were willing to contribute some amount to his income but no mechanisms for collection existed, then the actual financial rewards would be too low to induce enough doctors to endure the rigors of medical education.

For more than 15 years the Sears-Roebuck Foundation sponsored a program to help rural communities attract doctors. The core of this effort was local fund raising drives to build well-equipped clinics. As an added inducement, there were a variety of mechanisms by which the clinic and/or its contents was turned over to the new M.D.[19] Here we have an example of community demand for a doctor, which goes beyond the demand of patients who actually use his services. Everyone is willing to pay because all benefit from his presence or benefit to others.

What might constitute some of the spillover's benefits? First, health is clearly subject to risk as illustrated by the massive health insurance industry. A family will be willing to pay an annual premium to an M.D. just to ensure his presence even if they never use his services and directly contribute to his income.* Second, a local doctor is a very socially useful institution. Like the prison or the mental hospital, the doctor

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*Economists will recognize this as technically not an instance of spillovers but of option demand.

becomes the social garbage can for "problem" people. Family alcoholism, drug epidemics, teenage rebellion, and sexual maladjustment are typical of the endless stream of inconvenient and uncomfortable problems that few in a community are willing to deal with and therefore thrust upon the local M.D. Third, minimal access to health care is increasingly regarded as a basic right of all. Some citizens may be willing to augment a physician's real income to ensure at least his availability to the poorer segments of society.

A fundamental weakness, however, exists in this line of reasoning on spillovers. The rural community with no doctors is an extreme example. There can be no doubt that most citizens would be willing to pay a good deal to prevent the disappearance of our entire stock of physicians! But that is not the issue here. The question is, beyond the normal fees for service how much would most U.S. citizens be willing to pay a new additional doctor to locate in their present communities? There is an increasing suspicion that, in the aggregate, the nation has no shortage of M.D.s, but rather a geographic and specialty maldistribution. Medical schools now graduate 43% more doctors a year than in 1963. The addition of this output to the annual inflow of foreign medical graduates is increasing our supply of physicians twice as fast as our population. Yet if new physicians continue to specialize and locate as before, what benefits beyond direct patient care are we reaping? There is no evidence that these additional doctors are missing very much in the way of annual premiums non-patients might be willing to give them. We must conclude, therefore, that the spillover argument provides little justification for the present massive system of subsidies.*

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*The spillover argument can also be applied to medical schools themselves. Their very existence may raise health standards in an area, improve geographic distribution of physicians, and make possible complex research. The latter case will be dealt with in Part VI.

C. Artificial Prices

The third major cause of market failure is monopoly power in the economy. If a single firm has significant market power and jacks up the price of its output, clearly society will be paying more and purchasing less than it should be. Similarly, if the producer faces monopolistic control of key resources required for production, the artificial costs will usually force up the final price and again society loses through smaller purchases at inflated prices. Thus, the presence of monopolistic elements in the supply and demand for any good or service weakens the ability of a free market mechanism to create a proper level of production and consumption, because it must react to artificial prices which do not match the actual desires and resources of a society. Public intervention may therefore be required. How does all of this apply to medical education? As suggested previously, if medical students had to pay the full cost of their education, the number of high-quality applicants would certainly be increasingly sensitive to the balance between the high costs and future incomes. But what if the costs of education are exaggerated, inflated, and grossly out of proportion to the real costs to society of diverting resources to medical education? Clearly, we would expect too few doctors to endure these costs, and again we have a potential justification for subsidies to medical educators in order to bring the costs to the student down to an uninflated level.

Are the actual full costs too high? Medical school budgets are skyrocketing, but because of the multiplicity of services they provide, the exact costs of undergraduate training for physicians are hard to pin down. We can, however, suggest the following. Four years of medical school (not

counting student living and maintenance expenses) costs over $50,000. Approximately half of these costs are absorbed by faculty salaries, which are high by any university standard.[20] Between 1966 and 1972, the median salary for full-time clinical faculty soared from $20,100 to $30,300.[21]

Equally important has been the expansion of faculty. In the five years between 1966 and 1971, medical student enrollment increased by 10,227. Remarkably, to instruct these additional students medical schools hired 10,273 additional full-time faculty and another 2,750 salaried part-time faculty.[22] In light of such statistics, it is perhaps not surprising that Administration officials are now asking whether an increase "from one full-time faculty member for every seven students in 1950 to about one for every two students [is a] proper response to the problems we face in health care delivery."[23] *

Faculty costs, however, are not the whole story. Between 1966 and 1970, annual medical school expenditures increased by $1,702.6 million. Mushrooming full-time faculty rosters and salaries account for roughly only half of this expansion. Apparently, medical education is a high-cost, low-efficiency process in every phase of operation. On this point Professor Reuben Kessel has been a most articulate critic:[24]

> The change in the sources of income for medical schools has transformed medical school deans from businessmen. . . who

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*The actual figure for the academic year 1972-1973 is 33,550 full-time faculty which implies 1.4 students per instructor. In addition, the two years of clinical education involve substantial supervision from 7,880 paid part-time faculty and 26,300 residents. Full-time faculty, however, have other teaching responsibilities. If we count medical students, pre-doctoral science students, and full-time equivalents of nursing, pharmacy, etc. students as the basic teaching load of the full-time faculty, between 1958 and 1972 the student-faculty ratio fell from 4.0 to 2.3. (Data drawn from various issues of the Education Number, Journal of the American Medical Association.)

> catered to the desires of students, to mendicants who cater to governments and governmental agencies which have replaced students as the source of medical school income. This transformation has weakened incentives to produce physicians efficiently if at all.

Since high costs and inefficiencies have been consistently underwritten by the government, there has been no urgent necessity to change the organization or costs of medical education. Why, Professor Kessel asks, is the student required to study the first two years of basic science curriculum in a high-cost medical school when the same courses are often taught for much less in other university departments? Why do the second two years of extensive clinical experience have to take place within the walls of a medical school and not in a community hospital?* Experiments along these lines are taking place. Indiana and now Illinois have sought methods to expand their medical schools without the enormous cost of construction. Their solution involving satellite programs centered in community hospitals throughout the state promises not only elimination of expensive construction but more relevant and patient-oriented clinical experience.[26] Another West Coast university is experimenting with a program which offers the entire first two pre-clinical years of medical education in the existing university departments (see below p.23).

The conclusion is fairly clear. Asking students to pick up the entire cost of their medical education would require payments for a highly inefficient

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*In this connection, it is interesting to note that in a 1969 study of 13 foreign medical schools attended by more than 2,000 U.S. students, the average student-faculty ratio for 6 basic science departments was 56.1. The ratio for all U.S. medical schools is less than 3.1, a figure double that of even the best European schools. To the objection that the large foreign ratio is indicative of inferior education, one should note that these 2,000 U.S. students are allowed to take exams and practice medicine on the same basis as graduates of domestic schools. See footnote 25.

system with an artificially inflated price tag. It is tempting to reinforce this argument for a continuation of subsidies with the observation that the medical student is forced to pay for inflated faculty salaries. To obtain their faculty, medical schools must offer salaries and working conditions sufficiently attractive to lure a high quality of physicians away from private practice. To the extent that physicians have substantial monopoly power and overcharge for the value of their services, physician income and, consequently, medical school salaries are inflated.*

Yet this argument ignores the fact that although the student is overpaying, he too will eventually earn an income with monopoly elements. Whatever the element of monopoly, the physician will earn far more in additional income than he must pay in additional tuition. This is the fundamental weakness in the entire artificial prices argument for subsidizing medical education. While it is true that charging the student the full cost of training forces him to pay overblown fees, he in turn will earn an income with monopoly elements. It is not clear at all that this trade-off would still not be attractive enough to draw high-quality students into the medical schools. What is more, it is difficult to deny that some portion of the rising costs of medical education is simply due to the accelerating levels of public support. At the minimum, the inefficiency and excessive costs of medical education are indeed a slender reed on which to support almost $1 million in annual construction and non-research operations subsidies.

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*Several reasons have been advanced as to how physician fees are inflated beyond competitive rates. Among them: Third-party payment has had little real cost control with the patient having little interest in keeping down fees; an ill patient has no means of "shopping around" for doctors; physician quality is often judged by price; the limited number of physicians in any one specialty in a particular locality strengthens already strong sanctions against cutting fees. See footnote 27.

D. Risk and Imperfect Information

Any student in higher education selects his course of study and future career according to a whole host of considerations: an evaluation of his or her own abilities, occupational prestige, expected income, intrinsic interest, and cost and length of training, to name only a few. Considerable evidence exists to support the argument that given basic non-monetary rewards, career choice is significantly influenced by changes in the relative costs of training vs. expected future income.[28] There is a problem, however, in that undertaking the costs of education does not guarantee the future income. Pitted against future income are a risk of mortality, a risk of failing the educational program, a risk of not earning the average income of the profession, the possibility of unemployment, and so forth. Despite the presence of gambling in society, most of us are strong risk avoiders and will discount or adjust downward expected future income. Thus, while an accountant may compute the future return on the full cost of four years of medical school and find it an attractive investment, the risk involved could so heavily discount future earnings that not enough individuals would enter the profession. Subsidy is therefore required either to raise future income or to lower cost of training.

This element of risk is particularly apropos most undergraduate education.[29] Medical education, however, presents for the student one of the most riskless propositions available. Although physician incomes vary considerably, high future earnings are virtually assured. The attrition rate from medical school has been steadily falling so that less than 3.8% of entering first-year students fail to graduate, and there is no fore-

seeable possibility of unemployment.[30] Of all professions, therefore, future doctors can apply the lowest discounts for risk to their future attractive incomes. There is some element for subsidy, but the preponderance of the costs of education paid for by the state cannot be explained by this reason alone.

A more important problem must be considered. Fein and Weber in their major study of medical school financing point out that the factors which really determine student career choice are not actual realized prestige, enjoyment, income, etc., but the perceived value of these variables.[31] Students may have very inaccurate conceptions of future benefits, and indeed they consistently underestimate future earnings. The problem for medical education is that of all future professions, physician income is the most underestimated.[32] The trouble is that simultaneously they have a very accurate perception of the costs of medical school, so that applicants are reacting to an artificially low trade-off between financial costs and benefits. If we were to remove all of the present subsidies and require full payment, students might react far more negatively than the actual facts might warrent. A recent study of the causes of the large variations in the number of applicants to medical schools supports this argument. The number of applicants to medical school was ten times more sensitive to changes in tuition than to changes in physician income.[33]

This line of argument raises doubts about the extent to which the present subsidies could be cut in favor of some form of public loans. Yet might not a more efficient alternative to blanket subsidies be an extensive information program directed toward high school and college students? A clear statement of training costs with a glowing account of the rewards

to medical professions might be regarded as poor public relations in some circles. It could, however, inject a considerable element of rationality in the decision to enter a profession whose risks are so low. Beyond this simple proposal, a large expansion of present direct and guaranteed government loan programs with generous forgiveness options in lieu of service in areas of need could meet the financial needs of students and aid those otherwise unwilling to risk indebtedness for education. To the extent that one is unsure of how much could be accomplished by such programs, the most direct procedure would be to initiate an information campaign while cutting subsidies and raising loan funds in successive stages. Application statistics will signal difficulties.

IV. MEDICAL EDUCATION AND COMPETITION

In summary, have we established so far a case for using tax revenue to subsidize medical education rather than having the medical student pay the full cost? On grounds of equity, the present subsidy system is clearly unattractive. The contention that a subsidy is necessary because no one can finance the full cost is an argument for public intervention in finance markets and perhaps for aid to deserving students, but not for blanket subsidies to medical schools. Both the spillover and artificial prices arguments maintain that charging full-cost tuition would lead to a serious underproduction of physicians. Full cost would make prospective high-quality M.D.s increasingly sensitive to the high cost of education versus the financial rewards of practice. If the costs are artificially too high and the returns do not reflect the social value of physicians, then we would graduate too few physicians. The spillover justification maintains that the full social value of doctors exceeds an individual M.D.'s income. Undoubtedly,

physicians as a group benefit many more individuals than just those directly paying for care. What is doubtful, however, is whether there are significant extra social benefits beyond patient care to be gained from additional M.D.s. The artificial prices argument points to the induced inefficiencies and monopolistic prices in medical education. Yet it is just as likely that physician fees are also inflated, counterbalancing the costs. The factors of risk and imperfect information are problems for all higher education. They are, however, much more easily dealt with in medical training, because the risks and expectations for income and work conditions are relatively well defined. Dispensing adequate and accurate information on costs, failure rates, future income, and so forth can go a long way toward ensuring an adequate flow of applicants. Whatever argument for subsidies emerges from all of the above considerations is therefore fairly weak.

Yet our analysis up to now has treated medical education as if it is carried on in a vacuum when, in fact, it exists in a complex environment. Medical schools are surrounded by a multiplicity of institutions dispensing post graduate education. In addition, medical schools provide a wide variety of training programs as well as noneducational services. Moreover, schools compete among themselves for quality students and financial resources. The key word is "compete." Schools must compete not only with each other, but with completely different educational programs. Within each school, education of M.D.s must compete against the claims of other training programs as well as research and health care activities. Does this atmosphere of competition alter the conclusion that there is little justification for the present massive subsidies to medical education? An answer

emerges by examining three major areas of competition: rivalry with other university programs, within medical schools, and between medical schools.

First, all graduate and undergraduate training receives a multiplicity of public grants and appropriations. Halting all financial aid to medical education while leaving the rest of the subsidy system intact raises immediate problems of equity. Why should medical students receive no subsidy while fellow advanced degree students in medieval history or corporate tax law receive substantial public aid? Why should high physician income be singled out for special treatment when some graduates of prestigious schools of law and business administration can look forward to comparable standards of living? A medical student would feel particularly aggrieved, since he at least is producing a service with a definable benefit and demand. What exactly is the output of a Ph.D. in medieval Islamic history?

These equity considerations suggest an even more dangerous possible side effect of singling out medical education for full-cost tuition. There is potential for a vast misallocation of educational output by changing the costs of entering only one of many possible career alternatives. As stated above, students have been shown to respond with remarkable sensitivity to changes in costs and demand for different occupations. In this regard, education can often be usefully viewed as an investment which yields a life-time rate of return to a student. Given the relative prestige and agreeability of different occupations, changes in the relative rates of return can be expected to steer students from one education program to another.

Two recent studies estimated the rate of return to four years of medical school at about 20%.[34] The return to all graduate education runs

far lower, variously estimated at between 7% and 12%.[35] Charging full-cost tuition, however, to medical students alone would drop the return to medical school to below 15%.[36] If, in addition, physician income is corrected for the unusually long hours worked, the rate of return falls to and perhaps even below graduate levels.[37] This is a significant consideration. There is a limit to how far medical school tuition can be raised while public support for the rest of higher education remains unaffected. Highly qualified students may be steered toward other occupations simply because artificial subsidies make them a better investment and offer a future career unencumbered by an enormous educational mortgage.

Second, we have dealt with medical schools so far as if their sole function is to educate doctors. Schools also produce research. Following the Second World War, public funds were poured into medical research, until by 1963-64 almost 60% of all medical school expenditures were for sponsored research. This proportion has declined to the 30% level, but we still annually pump over $600 million of tax revenue a year into medical school research projects.[38] Few would contend either that research could survive without public funding or that medical schools are not an excellent milieu for scientific inquiry. What would happen, however, if education were completely unsubsidized while research continued to receive substantial support? Clearly, schools would scramble to write off all possible educational costs, and the results could be unfortunate. Medical education is already heavily criticized as being far too research oriented. The esoteric is exalted to the detriment of the mundane ills of everyday practice; the human organism is subdivided into a myriad of detailed specialties. Rather than reverse this aspect of education, a return to the pattern of the earlier 1960s,

where the bulk of public funds went specifically to research, would only pressure schools into reinforcing the role of education as a by-product of research. A symmetric argument can be made for the health care activities of medical schools. There is already concern that pressures to deliver services can get out of hand to the detriment of education. The educational value of rotating internships has already been severely questioned. Forcing schools to treat seniors and juniors as interns is not a happy alternative. In short, an unbalanced program of subsidies carries the implicit threat of distorting the process and content of medical education.

Beyond the influence of research and service activities, medical schools deliver a wide variety of educational programs. Indeed, the enrollment data summarized in Table 1 show that over the decade since 1962, medical students have increased slower than almost all other student categories serviced by medical schools. True, significant federal H.P.E.A. funding did not start until 1967, and the relative rates of growth between M.D. and non-M.D. students shifted after that date. Nevertheless, between 1967 and 1972, the infusion of federal funds helped support an increase of seven non-M.D. students for every ten additional M.D. candidates enrolled, and this does not count the enormous increase in residents and interns. Complicating this pattern of growth are the results of medical school cost studies which conclude that basic science students, interns, and residents all cost more to educate than medical students (Table 2). Moreover, medical faculty devote less time to the instruction of future M.D.s than to other student categories.[59] Clearly, the question of why we should subsidize medical schools cannot be solely limited to a discussion of medical students. An analysis similar to the one attempted in this paper needs to be applied to each student category. The complexity of medical schools, however, does imply one inescapable con-

TABLE 1: Growth of Medical School Enrollments and Teaching Responsibilities
1962 - 1972

	Enrollments			Average Annual Rate of Growth		
	1962-63	1967-68	1972-73	1962-1967	1967-72	1962-72
Interns	4,134	4,338	6,202	1.0%	8.6%	5.0%
Residents	13,539	17,630	26,354	6.0%	9.9%	9.5%
Predoctoral Basic Science	4,105	8,693	10,601	22.4%	4.4%	15.8%
Postdoctoral Basic Science	4,649	6,705	7,516	8.8%	2.4%	6.2%
Nurse, Pharmacy, etc. (full-time equivalents)	8,946	14,178	20,368	11.7%	8.7%	12.8%
Subtotal	35,373	51,544	71,041	9.1%	7.6%	10.1%
Medical Students	31,491	34,538	47,564	1.9%	7.5%	5.1%
Total	66,864	86,082	118,587	5.7%	7.6%	7.7%

Source: Education Number, J.A.M.A., Vol. 226, No. 8 (November 19, 1973), p. 906.

TABLE 2: Costs of Education Programs in Medical Schools

Study (Year)	Average Annual Per-Student Costs		
	M.D. Candidate	Basic Sciences	Intern/Resident
22 Large Medical Centers, 1964-65	$5,152	$6,503	$5,605
Seven Medical Centers, 1967-68	$3,700	$17,200	$7,000
Iowa Medical Center, 1967-68	$6,478	$6,654	$15,391 (Intern Only)

Source: adapted from Owen MacBride, "A Review of Studies of the Cost of Medical Education" (Unpublished monograph, University of Michigan: Bureau of Hospital Administration, School of Public Health, 1973), Table 12, p. 40. Studies are: Paul Wing and Mark Blumberg, Operating Expenditures and Sponsored Research at U.S. Medical Schools (Berkeley, California: Office of Health Planning, 1967); T.J.Campbell, Program Cost Allocation in Seven Medical Centers: A Pilot Study (Washington, D.C.: Association of American Medical Colleges, 1969); R.J.Latham, The Cost of Medical Education: An Empirical Analysis of Production (Doctoral dissertation, University of Iowa, Department of Economics, 1971).

clusion. Blanket appropriations to schools allow enrollment increases in a wide variety of programs. While these additional outputs may be perfectly desirable, they were neither the stated purpose nor the prime justification of the subsidy.

The third area of competition is the most difficult to analyze and holds the most uncertainties. If subsidies are cut off in lieu of some loan mechanism and schools must charge a full-cost tuition they will be thrown into increased competition with each other for students. The key imponderable here is whether inter-school competition in an unsubsidized environment will have a beneficial neutral, or harmful effect on medical education. The answer to this depends on the evaluation of three questions: First, what will be the effect of unsubsidized competition on the cost of education? Second, what will be the response of student demand for medical education to the increases in the price (tuition) they must bear? Third, will medical schools be able to alter their mode of operation in response to changing sources and amounts of revenue?

The evidence available on the effect of unsubsidized competition on the costs of education is fragmentary at best. Professor Reuben Kessel, however, has strongly argued that if schools are forced to compete for students paying substantial tuitions, they will be forced to find ways to eliminate expenses and increase the efficiency of the educational process.[39] This pressure is surely likely to develop, but given the inherent conservatism of most institutions of higher learning, including medical schools, this process will take a significant period of time to occur. Moreover, there is a limit to how far costs can fall. In particular, when arguments are made for locating medical education in standing university science departments or in scattered

hospital and other clinical settings, the savings being considered are the enormous capital costs of building a medical school. Yet these construction costs, although astronomical, are spread over many generations of graduates. They are not the prime force driving up the cost of education.

Operating costs, on the other hand, are greatly influenced by the highly faculty-intensive style of graduate education. For example, H.E.W. is now financing an experiment whereby the first two years of medical school are being carried out without a medical school in the basic science departments of a large West Coast university. This is precisely one of the suggestions made by Professor Kessel. Yet even if we double this experiment's student-faculty ratio, the annual program budget runs almost $12,500 per student.[41] In contrast, the National Academy of Sciences cost study implies an average annual cost for pre-clinical education of $10,900.[42] Cost studies from the mid-1960s seem to indicate that the high cost of the H.E.W. experiment is not an isolated phenomenon. As displayed in Table 3, these rough data suggest that graduate basic science is expensive regardless of whether it occurs inside or outside the confines of a medical school. The best comparison is probably between basic science students in medical school and zoology students in university departments since both involve substantial research and dissertation. There is at most a 23% saving in moving out of the medical school surroundings.

The same phenomenon of continued high cost may occur when the two clinical years of education are removed to hospital settings. The exploratory cost finding studies in Table 2 all conclude that the education of interns and residents in university hospitals costs medical schools con-

TABLE 3: Costs of Graduate Education in Selected Disciplines

Average Annual Per-Student Expenditures in the Academic Year 1964-65

M.D. Candidate	$3,334[A]	$5,152[B]	$5,837[C]
Non-M.D. Basic Science in Medical School	6,487[A]	6,503[B]	5,996[C]
Physics[D]		5,503	
Zoology[D]		5,137	
Sociology[D]		4,455	
English[D]		3,076	

Sources:

A. T.J. Campbell, Program Cost Allocation in Seven Medical Centers: a Pilot Study (A.A.M.C., 1969). Figures deflated from 1967-68 levels by an average of Consumer Price Index and Medical Care Price Index, and procedure which follows the analysis of Owen MacBride, "How Much Does Medical Education Cost?" Health Manpower Policy Discussion Paper No. A3 (Ann Arbor, Michigan: Health Manpower Policy Studies Group, School of Public Health, University of Michigan, August 1973).

B. Paul Wing and Mark Blumberg, "Operating Expenditures and Sponsored Research at U.S. Medical Schools," Journal of Human Resources, Vol. 6 (Winter 1971), pp. 75-102. Following the MacBride paper the figures are for state schools with large research budgets in 1964-65.

C. Robert Lathum, The Cost of Medical Education: An Empirical Analysis of Production, Doctoral Dissertation, Department of Economics, University of Iowa, 1971. Figures are for 1967-68 and deflated as in note A.

D. Estimates are from Irene H. Butter, Economics of Graduate Education: An Exploratory Study. Final Report (Washington D.C.: U.S. Department of Health, Education, and Welfare, Office of Education, Bureau of Research, November 1966). These figures are all classroom research and dissertation phases of education but are not of financial aid to students.

siderably more than that of M.D. candidates.[43] While junior and senior medical student training is not comparable to that of a resident, the students are less skilled and require even more intensive supervision than the high-cost graduates. Until additional data are made available, we must conclude that the primary factor driving up the cost of medical education is not construction but operating costs. Substantial savings in operating costs do not seem to materialize automatically when education is physically removed from schools of medicine.

Since a halt to public subsidies entails student responsibility for costs, and competition among schools is not likely to produce a spectacular cut in present costs, tuitions in the foreseeable future will be substantial. This brings us to the second question of the response of student demand. Even with a countervailing increase in loan funds, the high tuition will engender a fall in the number of applicants seeking admission.* The question must therefore at least be asked, will this fall in applicants put some medical schools out of business? Certainly, the present stagnation in undergraduate college enrollments has put severe strains on relatively high-tuition, low-prestige private colleges, and increasing numbers will be forced to close their doors. In a similar vein, any drop in applications for admission to medical school will probably not affect all institutions equally. Some schools might well be

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*It is difficult to predict how sensitive the number of applications would be to a drastic rise in tuition. The one study by Frank Sloan previously referred to (footnote 33) found a very significant relationship between changes in tuition and changes in application rates since World War II. Each dollar decrease in tuition generated an average of 6 to 14 new applicants. One must agree with the author, however, that this sensitivity is due in part to capital rationing--the inability to finance the cost. The changes in financing mechanisms which accompany a full-cost tuition policy are therefore crucial.

hard put to keep up their enrollments, particularly if they continue to adhere to very high standards for admission.

Table 4 illustrates the problem. Since 1967 the number of applicants to U.S. medical schools has been soaring so that the percentage accepted has steadily fallen. As a result, the average new student submits over 8 applications. To whom does he apply? There is enormous variation in the attractiveness of schools. Stanford receives 40 applications for each first-year position. The University of West Virginia receives only four. If a school presently enjoys a relatively small pool of applicants from which it chooses its entering class, and if, in addition, the size of this pool has been growing very slowly in comparison with sister schools, it is not illogical to suspect that the school will have great difficulty attracting a qualified student body under a full-cost tuition policy. On the assumption that public and private schools present a different market, Table 4 illustrates the situation of 15 schools which fall very low on both the present pool and its growth. Given the fact that for all U.S. medical schools the number of applications per opening increased almost 75% in 5 years, a school which finds its pool falling is in trouble.

The 15 schools in Table 4 had a total 1971 first-year enrollment of 2,122 or 18% of all U.S. medical schools. If tuition was raised to cover full cost, elite schools would have no difficulty. These fifteen, however, could well be in severe difficulty. Thus, the impact of such a policy does not fall evenly on all schools, but would hurt the few differentially.

In the face of the rise in tuition and resulting increased competition for students, the final question is: how will medical schools adapt to the

TABLE 4: Analysis of Applications to Fifteen Medical Schools

School	Applications per Opening 1971-72	Growth of Applications per Opening 1966-67; 1971-72	Tuition (est.) 1973-74
Average for 39 Public Schools[a]	12.1	92.1%	$925[b]
Average for 9 Public Schools[e]	4.7	4.4%	$912
Illinois	5.9	31.1%	$1,077
Indiana	4.2	-4.2%	$1,000
Kansas	4.3	2.4%	$1,020
Mississippi	5.3	1.7%	$850
Ohio State	5.9	11.3%	$1,200
Puerto Rico	3.3	-5.7%	$576
South Carolina	4.4	-6.4%	$1,000
Tennessee	4.8	23.1%	$975
West Virginia	4.0	-11.1%	$510
Average for 41 Private Schools[a]	21.4	63.3%	$2,634[d]
Average for 6 Private Schools[e]	11.6	2.3%	$2,249
Baylor	11.4	-8.4%	$2,800
Emory	12.3	-8.9%	$2,500
Howard	10.3	25.6%	$1,143
Loma Linda	7.8	2.6%	$2,500
Miami	6.8	30.5%	$2,050
Vanderbilt	20.9	-3.2%	$2,500

Sources: Dale Mattson, Davis Johnson, William Sedlacek, "The Study of Applicants 1966-67," Journal of Medical Education, Vol. 43, No. 1 (January 1968), pp. 1-13.

W. F. Dube, Otis G. Johnson, Bonnie Nelson, "Study of U.S. Medical School Applicants, 1971-72," Journal of Medical Education, Vol. 48, No. 5 (May 1973), pp. 395-420.

Education Number, Journal of the American Medical Association, Vol. 222, No. 8 (November 20, 1972).

Notes: a. Data for well-established schools only. Schools commencing operation before 1955 have individualistic patterns and are not included.

b. In-state tuition for residents counted only.

c. Estimated from six-week sessions assuming an eight-month scholastic year.

d. Excluding schools with in-state/out-state tuition differentials.

e. Calculated from group totals of new openings and applications received.

changing circumstances? This is truly speculative ground, for organizational response to the unknown is highly variable and difficult to predict. Some schools under stress may rapidly develop an entrepreneurial spirit and may adapt and survive. Others may fade away.* Even more unpredictable is the evolution of medical schools and the content of education offered. One possible result of interschool competition is institutional specialization, with some schools concentrating on primary care and others on highly research oriented medicine. Indeed, such an arrangement has already been proposed.[44] One conclusion can be drawn from these speculations. The adjustment process is unpredictable and will take time to evolve. This reinforces our earlier conclusion (see page 17) that a shift in public policy from subsidy to loans had best take place in stages starting, for example, with federal H.P.E.A. programs and subsequently converting state funding.

V. CONCLUSIONS FOR POLICY

We previously concluded that there is little justification for the massive flow of public monies into medical education. Yet when we examine the influence of the competitive world in which medical schools actually exist, we must amend this conclusion. A shift to a full-cost tuition policy, which ignores the effects of subsidies to other disciplines as well as research and health care support and the probable drop in application

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*A current study under the direction of Dr. Albert Williams of the Rand Corporation should shed some light on this problem. Using detailed data from 10 different medical schools, the factors conditioning their response to budget cuts are being examined. In addition an analysis of the current behavior of schools of public health should provide a relevant example. Although they have sustained a substantial budget cut, none are about to close. They are, however, having to rapidly reorder budget priorities. In contrast, despite a high demand for dental education, two schools of dentistry, at St. Louis University and Loyola University, closed in the 1960s. Why?

rates, is a policy left vulnerable to potentially undesirable side effects. The primary result is to place a floor below which subsidies cannot fall without carefully considering the results of competitive pressures.

This is not a neat conclusion, and given the complexity of the subject a simplistic and clear solution should be suspect. Yet we can draw an important policy prescription. The entire thrust of the preceding analysis was to compare the present system of massive subsidies to medical education with a no-subsidy full-cost tuition method of finance. This policy alternative, however, is surely artificial. The real question is, are present subsidies too high? This question has particular force since public funding of medical education is divided between federal and state support. State appropriations are larger and have been growing faster than H.P.E.A. federal grants for education.* Moreover, the basic current policy question is what should be done with the federal programs.

The following observations can be made. First, the repeated primary justification for public funding has been the threatened shortage of physicians in terms of additional doctors produced by medical schools. Yet past subsidies have been enormously inefficient. If we look only at specific federal appropriations for undergraduate training, between 1967 and 1973 it cost U.S. taxpayers in the neighborhood of $68,000 in new subsidies for each medical graduate in excess of pre-1970 levels of operation. The 1971 Comprehensive Health Manpower Training Act raises the figure to

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*Between FY 1967 and 1972, federal obligations to medical education through the Health Professions Educational Assistance Act programs increased from $123.7 million to $180.9 million. In the same period, school receipts from state and local grants and appropriations increased from $142.1 to $311.8 million. The latter figures do not include construction grants, where since FY 1971, the state role has outstripped the federal. See footnote 45.

$87,000; and if other local, state, and federal funding is added, the total runs well over $100,000 in additional subsidies for each additional graduate.[46] This enormous figure is far more than any estimate of the total average cost of four years of undergraduate education. Even more remarkable, H.P.E.A. funds form less than 30% of total non-research public grants to medical schools.

Second, the argument that the present level of subsidy is required to keep up our output of doctors falls apart in the face of the long lines waiting to get into medical school. At a minimum, for every two applicants accepted, another highly qualified student is turned away.[47] There is not nor has there been a shortage of potential doctors, only a lack of teaching facilities. The race to enter medical school is so intense that increasing numbers of Americans are going abroad for their medical education. The Carnegie Commission on Higher Education has estimated that 11% of American citizens studying medicine now study abroad, and the proportion is rising.[48] Given the present costs and returns to medical education, students obviously find medicine a highly attractive career. They could be asked to pay an increased proportion of the actual expenses of medical school with no damage to the quality or quantity of entering students.

Third, although we have discussed the potential inequities between disciplines if public funding was curtailed entirely only for medical schools, does not the present pattern of public support for higher education discriminate in favor of medical students? That is, compared with graduate students in other disciplines, do they not receive more public support not only in absolute terms but also as a proportion of the total cost of education? Little data are available to substantiate definitive answers to these questions, but the exploratory cost studies summarized back in Table 3

do indicate that medical students are favored. The full per-student cost of medical school appears to have been in the neighborhood of $5,200 in 1964-65, while a year of Ph.D. training in English came to only $3,070. Since tuitions within the same university exhibit little variation among disciplines, medical students are receiving higher levels of external support. The data also indicate that all physical sciences apparently enjoy high support. Charging higher tuitions for all higher-cost programs would therefore be a move in the direction of equity.

Fourth, there is now a serious question of whether we in fact need to increase the capacity of medical schools. This is not the place to enter the debate over the doctor shortage. Yet few would disagree that the real heart of the crisis in physician manpower is that too many are in narrow specialties, too many waste time and effort in a poorly organized, low-productivity health system, and too many are concentrated in affluent urban areas leaving many citizens underserved. If indeed these are the major issues confronting physician manpower, the present strategy of subsidization does little to meet the problem.

In light of these four considerations, it is difficult to defend the present level of public support for medical education. Certainly none of the previously discussed rationales for subsidy counter these arguments that present government funding is excessive. Instead they only raise questions about how far and how fast subsidies can be cut. What is currently needed from the Federal Government is therefore not

a further extension of the present subsidy system but an intervention in capital markets so that medical students can finance their education and individual medical schools can modernize and expand their operations.* It is important to emphasize that there is a substantial difference between a shift of public policy from grants to long-term loans and a simple cut in public funding while maintaining the present programs. The latter alternative raises the possibility that schools, at least in the short-run, will respond by wholesale cutbacks of entire programs. Since the schools' criteria for elimination may be very different from the rest of society's, this course requires some careful projections as to what will be eliminated.[49] The former strategy, that of moving from grant to loan, does not imply an automatic reduction in resources; it merely replaces their source. The detailed elaboration of programs which directly answer the problems of imperfect capital markets while replacing the present funding system should therefore be given a high priority.

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*The general thrust of this conclusion dovetails with the growing awareness that graduate students of all disciplines need to pay a much larger proportion of their educational costs. See the several final reports of the Carnegie Commission on Higher Education, particularly, New Students and New Places: Policies for Future Growth and Development of American Higher Education (New York: McGraw-Hill Book Company, 1971). This contrasts sharply with the commission's call for a sharp reduction in medical school tuition through increased federal subsidies. Higher Education and the Nation's Health (1970).

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FOOTNOTES

1. The $2.8 billion includes $108.9 million in construction obligations through the Nurse Training Act, approximately $904.7 million in construction through H.P.E.A. (although the obligations for FY 1973 are only estimated as $100 million), and $1,820.8 million in institutional and student support for all health professions schools. These figures were drawn from: U.S. Department of Health, Education and Welfare, Public Health Service, National Institutes of Health, Construction Grants Administered by the Division of Physician and Health Professions Education (Washington, D.C.: June 30, 1972); National Institutes of Health, Bureau of Health Manpower Education, Construction Grants Awarded to Schools of Nursing, December 1965-June 1972 DHEW Publication No. (NIH) 73-89 (Washington, D.C.: July 1972) and attached unpublished summary for FY 1973; U.S. Department of Health, Education and Welfare, Report to the President and Congress: The Health Professions Educational Assistance Program (Washington, D.C.: 1970); and unpublished data provided by the Health Resources Administration, National Institutes of Health.

2. The estimates for total federal obligations for health manpower training are drawn from: Executive Office of The President, Office of Management and Budget, Special Analyses, Budget of the United States Government, annual issues for FY 1968 and FY 1974 (Washington, D.C.: G.P.O., 1967 and 1973).

3. These figures include all federal, state, and local grants and appropriations for sponsored research and training as well as operating budget support. They exclude all expenditures for construction and a small amount for the indirect or overhead costs of contracts and grants from state and local governments. The figures are for the academic years 1961-62 and 1971-72, and are drawn from the Education Numbers of the Journal of the American Medical Association, Vol. 190, No. 7 (Nov. 16, 1964), and Vol. 226, No. 8 (Nov. 19, 1973).

4. Public subsidies to medical education per se are impossible to pin down exactly. Here they are defined as the sum of receipts by medical schools of state appropriations and state and local grants in aid during the academic years 1962-63 and 1971-72 plus N.I.H. obligations for undergraduate training for FY 1963 and H.P.E.A. and Office of Education obligations for FY 1972. Not included are construction grants and research or research training grants. Sources: Education Number, Journal of the American Medical Association, Vol. 226, No. 8 (November 19, 1973); "Datagram," Journal of Medical Education, Vol. 42, No. 4 (April 1967), p. 574; and sources listed in footnote 1.

5. For examples of these critiques within and without the Federal Government, see: Address by Dr. Charles Edwards before the 1973 annual meeting of The Association of American Medical Colleges, as summarized in Health Manpower Report (November 13, 1973); Charles Stewart and Corazon Siddayao, Increasing the Supply of Medical Personnel (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1973); Reuben Kessel, "Higher Education and the Nation's Health: A Review of the Carnegie Commission Report on Medical Education," Journal of Law and Economics, Vol. 15, No. 1 (April 1972),

pp. 115-127; Kessel, Review of Fein and Weber, Financing Medical Education, in Journal of Political Economy, Vol. 81, No. 3 (May/June 1973), pp. 803-804; Jeffrey Harrison and Kent Nash, "A New Approach to the Physician Shortage," Inquiry, Vol. IX, No. 1 (March 1972), pp. 34-39.

6. Institute of Medicine, National Academy of Sciences, Costs of Education in the Health Professions, Report of a Study, Parts I and II (Washington, D.C., January 1974); and Association of American Medical Colleges, Undergraduate Medical Education: Elements--Objectives--Costs (Washington, D.C., 1973). The actual average tuition and fees paid is estimated by the author from the results of a 1970 sample survey conducted by the Division of Manpower Intelligence and summarized in the testimony of Dr. Kenneth Endicott, Director, Bureau of Health Manpower Education, Departments of Labor and Health, Education, and Welfare Appropriations for 1973; Hearings before a Subcommittee of the Committee on Appropriations, House of Representatives, Part 4 (Washington, D.C.: G.P.O., 1972), pp. 1046-47. For further details, see: George E. Wright Jr., "The Efficiency of Federal Subsidies to Medical Education," Health Manpower Policy Discussion Paper No. A8 (Ann Arbor, Michigan: Health Manpower Policy Studies Group, University of Michigan, School of Public Health, May 1974).

7. The above data on income and education are drawn from: Louis Smith and Anna Crocker, How Medical Students Finance Their Education (HEW, National Institutes of Health, Division of Physician Manpower, 1970).

8. In 1971 mean income of all U.S. families was $12,703 vs. a mean family income of physicians of $34,752. Between 1967 and 1971, average adult male annual earnings increased at 6.55% a year from $6,357 to $8,023. Physicians' income jumped from $21,104 to $30,505 at a rate of 11.14% a year. U.S. Department of Commerce, Bureau of the Census, Current Population Reports series P-60, Issues: No. 59 (1969), Table 6; and No. 85 (1972), Tables 37 and 55.

9. Dr. Charles Edwards, loc. cit.

10. See Theodore W. Schultz, "Optimal Investment in College Instruction: Equity and Efficiency," Journal of Political Economy (Special Issue: "Investment in Education: The Equity-Efficiency Quandary"), Vol. 80, No. 3, Part II (May/June 1972), pp. 1-30. See numerous other articles in this issue.

11. While the total contribution of physicians to health may be large, their marginal contribution appears small. More important, the only available health status index, age-specific mortality rates, may be too crude to reflect fine distinctions. For statistical studies see: Victor R. Fuchs, "Some Economic Aspects of Mortality in the U.S." (New York: National Bureau of Economic Research (mimeo), 1966), and review of additional studies in Paul Wing, Planning and Decision Making for Medical Education: An Analysis of Costs and Benefits, Ph.D. dissertation (Berkeley, California: University of California (mimeo), 1971), pp. 111-114 and 144-145.

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12. The most obvious case of physicians creating their own demand appears to be excess surgeons creating excessive surgery. For the latest evidence and a summary of previous studies see Eugene Vayda, "A Comparison of Surgical Rates in Canada and in England and Wales," The New England Journal of Medicine, Vol. 289, No. 23 (Dec. 8, 1973), pp. 1224-8. The problem, however, is far more complex than surgery. See M.A. Faltzan, "Medical Care Costs and Physician Manpower: A New Economic Theory," Canadian Medical Association Journal, Vol. 108 (May 1973), pp. 101-105.

13. These figures from Smith and Crocker, op. cit., pp. 14-15.

14. 1974 costs estimated by extrapolation. The money costs to students have risen at a remarkably constant rate of 6.5% a year since 1959. The average cost to the student for four years of medical school was estimated in surveys as $11,642 in 1959 and $22,116 in 1971. Sources: "Datagram," Association of American Medical Colleges, Vol. 1, No. 2 (March 1968); and an unpublished survey made by N.I.H.'s Division of Manpower Intelligence reported in testimony of Dr. Kenneth Endicott, op cit.

15. The best current estimate of the full cost of four years of education is $50,600. Since some of this is covered by research grants and patient reimbursements, the uncovered portion in 1972-73 was $38,800; but these are highly variable, running as high as $56,600. Institute of Medicine, op. cit., Tables 35 and 52, pp. 62 and 90.

16. Bernard Nelson, Richard Bird, Gilbert Rodger, "An Analysis of the Educational Opportunity Bank for Medical Student Financing," Journal of Political Economy, Vol. 47, No. 9 (August 1972), pp. 603-611; Marc Nerlove, "On Tuition and the Cost of Higher Education," Journal of Political Economy, Vol. 80, No. 3, Part II (May/June 1972), pp. 178-218.

17. This classic example is drawn from Rashi Fein, The Doctor Shortage: An Economic Diagnosis (Washington, D.C.: The Brookings Institution, 1967), p. 15.

18. Lee Hansen, "Equity and the Finance of Higher Education," Journal of Political Economy, Vol. 80, No. 3, Part II (May/June 1972), pp. 260-273.

19. Medical Economics (Sept. 11, 1972), p. 119; and personal communication from Edward L. Quinn, Executive Director, The Sears Roebuck Foundation.

20. Institute of Medicine, op. cit. The full allocation of faculty salaries is difficult to determine from currently available data. For instruction costs only the Institute of Medicine finds faculty salaries at 43% of total expenditures. The A.A.M.C. study, op. cit., has a similar breakdown of 47% (percentages calculated by the author). Faculty salaries in the research and clinical components of education are apparently a higher proportion of costs in both studies.

21. The comparable figures for basic science faculty are $14,960 and $20,300. Faculty salary data are drawn from "Datagrams," Journal of Medical Education, Vol. 44, No. 4 (April 1969), pp. 317-318; and Vol. 48, No. 6 (June 1973), pp. 597-602. The 1968 median was estimated by the author as a weighted average of four ranks in each of eight departments. This is not a legitimate statistical operation, but the high degree of disaggregation controls for markedly skewed distributions. The estimate is therefore probably close to the actual.

22. Council on Medical Education, American Medical Association, Medical Education in the United States, issues for 1966-67 and 1971-72. The 2,750 increase in salaried part-time faculty is an estimate by the author. Salaried and volunteer increased from 38,331 to 61,135 in 1971, of which 12.1% were salaried. This percentage was applied to the increase of 22,804.

23. Dr. Charles Edwards, op. cit.

24. Kessel, "Higher Education and the Nation's Health," op. cit., p. 126.

25. Henry R. Mason, "Foreign Medical Schools: Organization and Expenditures in 13 Schools Attended by More than 2,000 U.S. Students," Journal of the American Medical Association, Vol. 217, No. 13 (Sept. 27, 1971), pp. 1845-46.

26. R.M. Magraw, et al., "Perspectives From New Schools: the Costs and Financing of Medical Education," New England Journal of Medicine, Vol. 289, No. 11 (September 13, 1973), pp. 558-62; Steven Beering, George Lukemeyer, and Glenn Irwin, "Statewide Medical Education in Indiana" (Mimeo report).

27. The presumption of monopoly power and resulting inflated fee schedules is widespread, but its extent is difficult to pin down. Cf. Kessel, "Higher Education and the Nation's Health," loc. cit.; J.P. Newhouse, "A Model of Physician Pricing," Southern Economic Journal, Vol 37 (October 1970), pp. 174-183; Martin S. Feldstein,"The Rising Price of Physicians' Services," Review of Economics and Statistics, Vol. 52 (May 1970), pp. 121-133; Milton Friedman, "Occupational Licensure," Capitalism and Freedom (Chicago: University of Chicago Press, 1962).

28. Schultz, op. cit., p. 23. Richard Freeman, The Market for College Trained Manpower: A Study in the Economics of Career Choice (Cambridge, Mass.: Harvard University Press, 1971).

29. Marc Nerlove, op. cit., pp. 185-188.

30. Calculated from data presented in the Council of Medical Education, American Medical Association, Medical Education in the United States 1971-1972; Table 19, p. 981.

31. Rashi Fein and Gerald I. Weber, Financing Medical Education (New York, etc.: McGraw-Hill Book Company, 1971), pp. 78-93.

32. From a survey of students in Massachusetts by Richard Freeman, op. cit.

33. Frank A. Sloan, "The Demand for Higher Education: The Case of Medical School Applicants," The Journal of Human Resources, Vol. 6, No. 4 (Summer 1971), pp. 466-489. Each dollar reduction in tuition generated on the average 6 to 14 applicants. A dollar increase in physician income attracted only 0.4 to 1.3 individuals. The author explains the differential largely in terms of inability to borrow tuition costs and the discounting of future physician income.

34. Frank Sloan, Lifetime Earnings and the Physician's Choice of Specialty (Washington, D.C.: The Brookings Institution, 1969); (P-4068); and Fein and Weber, op. cit., Appendix C. Sloan estimates the internal rate of return to general practice as 23.7% in 1959 and 24.1% in 1965. The income stream, however, is apparently not deflated for taxes so the real rate should be lower. Fein and Weber make several estimates for 1967 which vary from 15.1% to 33.6% depending upon assumptions. The high rates are based on extreme assumptions with the more normal assumptions producing rates between 17.8 and 22.1%. Fein and Weber also quote Sloan's doctoral dissertation where the rates were computed annually and vary in the mid-1960's between 16.1 and 18.2%. The 20% figure is therefore probably high. For a critical review see Cotton Lindsay, "Real Returns to Medical Education," The Journal of Human Resources, Vol. 8, No. 3 (March 1973), pp. 331-48.

35. Giora Hanoch, "An Economic Analysis of Earnings and School," Journal of Human Resources, Vol. 2, No. 3 (Summer 1967), pp. 310-329, estimates the internal rate of return to all graduate training beyond college regardless of degree completion or specialty as averaging 7%. L.C. Maxwell, "Some Evidence on Negative Returns to Graduate Education," Western Economic Journal, Vol. 8 (June 1970), pp. 186-89, estimates the rate as 12.6%. For review of other estimates see Lindsay op. cit., p. 337.

36. Fein and Weber, op. cit., calculate the effect on computed rates of return of granting an annual scholarship as $2,500. Depending upon assumptions, the scholarship raises the return 3.3, 2.1, or 1.7 percentage points. The $2,500 scholarship is 2.5 times the additional cost students would have to bear if full-cost tuition was charged. Using the mid-point change estimate therefore gives a drop in the rate of return of 5.25 percentage points. This is not a statistically accurate computation and gives only a rough idea of the change. An analysis of dental education, however, shows an even larger drop in rates of return (from 26.8 to 17.4%) when full-cost tuition is charged. See Paul J. Feldstein, Financing Dental Care: An Economic Analysis (Lexington, Mass., Toronto and London: D.C. Heath and Company, 1973), p. 91.

37. Cotton Lindsay, op. cit., investigates the bias inherent in ignoring the 60 plus hour work weeks the average physician experiences vs. the 40 to 45 hour week for most college graduates. The effect on rate of return is not calculated, but the present value of the future incomes in the Sloan and Fein and Weber studies is cut by more than half.

38. The Executive Office of the President, Office of Management and Budget, Special Analyses, Budget of the United States Government, FY 1974 (Washington, D.C.: G.P.O., 1973), gives federal obligations for research

in medical schools as $678, $576, $615, and $648 million for FY 1971-74. The Education Number of the Journal of the American Medical Association, Vol. 226, No. 8 (November 19, 1973), shows federal research expenditures as $366 and $440 million for academic years 1970-71 and 1971-72. The discrepancy is apparently due in part to a different treatment of training grants. The reader should carefully note that any research-nonresearch division of expenditures is very rough since there is a great deal of leakage back and forth across category. Nerlove, loc. cit., has a pioneering discussion of the role of research and higher education.

39. Institute of Medicine, op. cit., Table 38, p. 71, shows distribution of faculty time. Medical students recieved 17.8% vs. 27.7% for other students.

40. Kessel, "Higher Education and the Nation's Health," op. cit.

41. Calculated by the author from detailed contract budget. The actual annual budgeted cost is $299,290 for twelve students, or $24,910 per student. The budget called for a teaching faculty of 3.5 full-time equivalents.

42. National Institutes of Medicine, op. cit., Table 33, p. 62. Since little basic science faculty time is spent in patient care, this figure is the sum of instruction plus research costs. The A.A.M.C. study, op. cit., implies an annual full cost for basic science education of $16,640, which was estimated by assuming that all instruction was by non-M.D.'s and that all medical school classes were the same size. Research and administrative costs of basic sciences were doubled, while all clinical activity and research costs were ignored.

43. Very little is known about clinical costs of education. Applying the same methodology to the A.A.M.C. study as in footnote 41, clinical education costs $28,166 per student per year. A recent study of family practice residencies in Indiana finds an annual average cost per resident of $34,097. Health Services Management, Family Practice Residencies in Indiana (Indianapolis, 1973). An interim report.

44. E.F. Rosinski, "Education and the Role of the Physician: A Redefinition," Journal of the American Medical Association, Vol. 222, No. 4 (October 23, 1972), pp. 473-75.

45. The data for H.P.E.A. obligations is drawn from unpublished data from the Bureau of Health Resources Development, and U.S. Department of Health, Education and Welfare, Report to the President and Congress: The Health Professions Educational Assistance Program (Washington, D.C., 1970). The state and local appropriations are drawn from Education Number, J.A.M.A., op. cit.

46. George E. Wright,"The Efficiency of Federal Subsidies to Medical Education," Health Manpower Policy Discussion Paper Series, No. A8 (Ann Arbor, Michigan: Health Manpower Policy Studies Group, School of Public Health, University of Michigan, May 1974).

47. Fein and Weber, op. cit. p. 216, estimate that one-third of the unaccepted applicants to medical school are fully qualified. In 1972-73, 13,757 were accepted and 22,409 were rejected. It is interesting to note, however, that the mean MCAT exam scores of rejected applicants runs over 90% of accepted scores, and that this proportion is rising. Calculated from data presented by W.F. Dube, Otis G. Johnson, and Bonnie Nelson, "Study of U.S. Medical School Applicants: 1971-72," Journal of Medical Education, Vol. 48, No. 5 (May 1973), p. 406. Another study suggests that there are two qualified applicants for every open place in medical school. National Advisory Commission on Health Manpower, Report, Vol. I (Washington, D.C.: G.P.O., 1967), p. 17.

48. Carnegie Commission on Higher Education, Higher Education and the Nation's Health (New York, etc.: McGraw-Hill Book Company, 1970), p. 37. See Kessel, "Higher Education," op. cit., for analysis.

49. The same point has been made regarding elimination of hospital inefficiencies by simply cutting expenditures. John M. Stagl, "Will Financing Determine Program?" Journal of Medical Education, Vol. 46, No. 12 (December 1971), pp. 1035-46. On the vulnerability of new programs emphasizing service delivery, see Fein and Weber, op. cit., pp. 34-45.